"Quantitative Risk Assessment System (QRAS)"

Akash Gupta

The Quantitative Risk Assessment System (QRAS) is a window based software tool for conducting today's most advanced Probabilistic Risk Assessment (PRA).

Probabilistic Risk Assessment (PRA) requirements by NASA for assessing the safety impact of proposed upgrade to its space systems, initiated the development of the QRAS as a PRA tool. The most advanced theories and techniques were adopted during the development of the tool to address and assist NASA's engineers with their PRA issues and yet user –friendly features of the tool allows non-expert users to take advantage of QRAS full potential.

QRAS allows system risks to be evaluated, compiled and managed by breaking down system into smaller sub-systems, phases and failure models. Each of these failure models is further elaborated in the form of Event Sequence Diagrams (ESD) and fault trees. Quantification of the basic events can be done using the set of quantification models familiar to engineers. QRAS' graphical user interface provides a structured guidance in order to facilitate its use. Furthermore, QRAS includes a strong support for modeling approaches not typically found in tools developed for the nuclear industry, such as phased-mission modeling. Finally, QRAS applies leading edge Reduced Ordered Binary Decision Diagram (ROBDD) technology for the accurate and efficient computation of risk results.

This paper would give an overview of QRAS version 1.8. the presentation shall introduce the modeling methodology available to the risk analyst in QRAS. These include descriptions of the system hierarchy, mission timeline, event sequence diagram and fault tree models, completed by the basic event quantification and common cause failure models. Further more, an overview of the BDD-based computational engine will be provided, followed by a brief discussion of the performance of these algorithms in an application on parts of the International Space Station PRA model.